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positive evidence.——Those interested in nervous anatomy may find an exhaustive article on the central nervous system of the baleen whales, by G. A. Guldberg, in the Forhandlingar of the Scientific Society of Christiania for 1885, published during the present year.——G. Fritsch describes the histology of the skin and the lateral-line organ of the electric cat-fish in the Sitzungsberichte of the Berlin Academy of Science for April, 1886.

ANTHROPOLOGY.[1]

Australian Medicine Men.—In one respect it is unfortunate that the sorcerers among savages should be called "medicine men," they are not merely practitioners of medicine. Furthermore, all savage tribes have arrived at a certain stage of empirical medicine and know the healing and poisoning qualities of certain minerals and plants. The dawn of medicine, as of all else which we believe and practice, was in the day of the primitive savage.

We are concerned here with the doctor or medicine man, who, in Australia, Africa or America, relies upon his influence and power over the spirit world to work cure or to save life.

In our own country patient study is revealing much concerning this important class. Major Powell and several other gentlemen of the Bureau of Ethnology have paid personal attention to them. We are indebted to the London Anthropological Institute for the publication of important papers upon the "Blackfellow Doctors" of Australia, notably that of Mr. A. W. Howitt, in Vol. XVI, pp. 23–58. The men and women who in lower tribes stand for the clergy as distinguished from the laity, or uninitiated, are variously styled doctors, wizards or witches, sorcerers, seers or prophets, mediums, soothsayers, necromancers, rain-makers (better weather-makers), magicians, augurs, fortune-tellers, enchanters, priests, personators, diviners, etc.

Now these can readibly be divided into two classes or functions, viz., those who see into, understand and reveal the spirit world; and those who have more or less control over it, compelling it to do their bidding.

The medicine man, doctor, sorcerer, wizard, fetish man are all of the latter class. Whatever disease and death may be, whether merely the person or spirit of some noxious thing or an independently existing spirit, one of the powerful charmers can induce or compel it to do his bidding, either by direct command or by some diplomatic action called magic.

In the collection of material for a scientific investigation of this class of persons, I have found it convenient to adopt the following questions:

1. What are the actors called and what social rank do they hold.
2. By what rites or initiations do they attain to the privileges of their class.

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[1] Edited by Prof. Otis T. Mason, National Museum, Washington, D. C.

3. What do they profess to do? What are they believed to be able to do? That is, to which class above named do they claim to belong?
4. What do they actually perform? What is their mode of treatment? Do they sing, dance, go into ecstasy, suck the wound, spit out the disease in the form of a bone, stone, &c.? That is, not what they claim to do, but what do they actually? What dress, paraphernalia, implements and dramatic performances do they resort to? What fees do they charge?
5. What is the area of their operation, both in the spirit and in the mundane world? Some cause, others cure disease. Some have influence in one sphere, others in other spheres of spirits. Again, some operate on the sick, others on the conjured, lovers, lost cattle, epilepsy, etc.
6. Folk-lore, beliefs and customs of the folk in view of the foregoing subjects of inquiry.

Thanks to the efforts of Mr. Howitt and others we are able to answer some of these questions concerning the Australians. "I have adopted," says this author, "the term medicine men as a convenient title for this memoir, but the term 'doctor' or 'blackfellow doctor' is always used in Australia for those men in a native tribe who profess to have supernatural powers. The doctors are magicians or wizards. I may roughly define doctors as men who profess to extract from the human body foreign substances which, according to aboriginal belief have been placed there by the magic of other doctors, wizards or supernatural beings, such as the *Prewin* of the Kurnai, or *Ngarang* of the Woiworung."

The social relations of these blackfellow doctors to the community varies from tribe to tribe. In some tribes the head man need not be a wizard, but is either a very brave man or a man of influence. Among the Muning tribe the *gommera* is both head man and sorcerer combined. He is the *biambian*, or master of his local group. The oldest *gommera* is the *bambian* of the other *gommeras*. He must be gray bearded, speak several dialects and "bring things out of himself."

A vast deal of mystery surrounds the education of the doctors. Mr. Howitt narrates at full length, pp. 49–52, the story of his own initiation told by one of his friends.

As said, the doctor and wizard are associated in function. They profess to project a quartz crystal or black stone against or into their victim or into their own bodies, to cause magical things to enter a victim by burying them in his tracks, and on the other hand to annul the power of these introjections. These same clergy claim to know and to compel or restrain the weather (meteoroscopy or meteorocracy), to fly through the air, to metamorphose themselves into animals, to be invisible and to render persons and things invisible, to talk and associate with ghosts and familiars, to abstract a man's fat, to discover the causes of death, disease or evil fortune, and finally to produce a distant effect upon a person by performing it upon a part of him or something he has touched or held.

There comes out in this study the very best interpretation of the synecdochical sorcery and medicine. Why should a piece of the man or of something he has touched be burned with the thorn, burr or thing that is to do the fatal action? Why simply to give the spirit of this hurtful thing the scent of the man, just as hunters train young dogs by allowing them to smell a piece of the hide of the animal they wish to be caught.

As to the actual performances, dress and implements of the doctors, Mr. Howitt is very explicit.

All doctors carry rock crystals and use them in their practice. Some diseases, such as rheumatism, are supposed to proceed from rock crystals. Indeed the afflicted can feel the little stones in the affected part. The doctor frequently sucks the part in pain, expelling a foreign body, a mouthful of wind or a quantity of blood. He manipulates and squeezes the patient, singing charms and performing innumerable mysterious actions.

In producing a spell the doctors often fasten the fatal object to the end of a throwing stick with hawk feathers and some human or kangaroo fat, and stick the weapon slanting in the ground before the fire. It falls down. The wizard has meanwhile sung his charms and the spell is completed. Again the pounded flesh of a dead man is mixed with tobacco, or the cones of the *Casuarina quadrivalvis* are thrown into the fire so that their spirits or little seconds may get under his eyelids and produce granulation.

A powerful magical implement is the *yulo*, an implement twelve inches long made of the leg bone of a kangaroo, pointed, having attached to it a long cord of twisted sinews, thirty-six inches long, ending in a loop. It is used by the wizard for binding their victims from whom they wish to take the kidney fat. Watching until the victim sleeps he creeps up, passes the bone under his knees, around his neck and through the looped end of the cord.

It is also pointed at people and is supposed to cause death by entering into them. The wizard was supposed to swing the *yulo* around his head and sling it at his victim.

From Mr. Howitt's language we would suppose they really take the fat from the dead and eat it, and that he really binds his living victim with the *yulo*, or knocks him down with the *brepent*, sits astride his chest, cuts open the right side below the ribs, extracts his fat, brings the cut edges of the wound together, and bites them to make them join so that no scar will be visible.

We will close this note with allusion to the *yenjin*, a song of elopement sung by a class of wizards called *Bunjil yenjin*, whose occupation is to aid in the elopement of young couples. When a young man wanted a girl whom he could not obtain from her parents, he employed one of these professionals. The latter would lie near the camp with the youth and his companions and sing a song, the others joining in the chorus. When he thought his spell strong enough he ceased, and the young folks, *nem. con.* would take to the bush together.

THE ICONOGRAPHIC ENCYCLOPÆDIA.—The second volume of this publication is based on von Eye's Culturgeschichte, but has a chapter on Prehistoric Archæology, by Professor Daniel G. Brinton, which doubles the value of the original work. We have no hesitation in placing this article at the head of all compendiums upon this subject. The method of treatment is historical.

The introductory chapter is devoted to a sketch of the science and the methods and problems which have for the past quarter of a century engaged the minds of archæologists. The characteristics and art productions of the European age of stone in its two periods, the palæolithic and the neolithic; the age of bronze and the age of iron are treated in the first fifty pages.

The prehistoric archæology of the western hemisphere is treated under the following analysis:

I. Palæolithic period.
    1. The Palæolithic period of North America.
    2. The Palæolithic period of South America.
        Concluding remarks on the Palæolithic period.
II. Neolithic period.
    A. Archæology of the United States.
        1. Art in stone.
        2. Pottery.
        3. Bone.
        4. Shell.
        5. Metals.
        6. Other ancient remains.
    B. Archæology of Mexico and Central America.
        1. Art in stone.
        2. Metals.
        3. Pottery.
        4. Bone and Shell.
        5. Paper.
    C. Archæology of the Andean nations.
        1. Art in stone.
        2. Art in bone, shell and wood.
        3. Metals.
        4. Pottery.
        5. Other arts.
    D. Archæology of Southern and Eastern South America and the West Indies.
        1. Art in stone.
        2. Pottery.
        3. Metals, bones and shell.
            General observations on American art.

It is marvelous to see how much Dr. Brinton has crowded into such a small space. No one is expected to say everything in an encyclopædic article. The only improvement we could suggest would have been to give with each paragraph a reference to the most distinguished treatise on that topic. This would have done little more than to fill out the closing lines, and would have made the paper little longer. It will probably be a long time before any other author half so qualified as Dr. Brinton will try to cover the whole ground of American archæology.

MICROSCOPY.[1]

REVOLVING AUTOMATIC MICROTOME.—The microtome represented in the accompanying cut is the invention of Adam Pfeifer, mechanic and instrument-maker to the Biological Laboratory of the Johns Hopkins University.

The machine is designed to save time and labor in the preparation of series of sections, and to attain at the same time the greatest uniformity in the thickness of the sections.

The mechanism is very simple. The frame (Fig. *B*) contains a horizontal screw beneath the sliding carriage (*C*). The carriage carries the knife (*K*). This carriage is moved forward by turning of screw. Two arms of the frame support the axis (*J*) of the revolving wheel (*E*), to which the imbedded object is attached. The knife (*K*) is clamped in an upright position on the arms rising from the sliding carriage, so that the edge of the knife is in the same horizontal plane with the center of the axis (*J*). Thus, as the sliding carriage is moved by the screw, so the knife is moved to or from the revolving object. The carriage slides by means of grooves on raised tracks of the frame, and is not directly connected with the screw, but is simply pushed by nut (*N*). This arrangement makes it impossible that any slight eccentricity of the screw should cause a jolting of the carriage.

The head of the screw is a solid wheel (*M*) at the end of the frame, and has 250 ratchet-teeth on its circumference. The screw has twenty threads to the inch (= .025$^{\mathrm{m}}$). The knife, therefore, is moved an inch by twenty revolutions of the screw; and as there are 250 teeth to the revolution, each tooth represents $\frac{1}{20 \times 250} = \frac{1}{5000}$ inch (.005$^{\mathrm{mm}}$).

The handle (*O*) turns the axis (*J*), to which is attached the wheel (*E*). This wheel is four inches in diameter, and to it is fastened the clamp which holds the object to be cut. The axis also carries a fly-wheel and an adjustable eccentric wheel (*W*), which is figured apart in a corner of the illustration. This eccentric moves a lever (*L*), the long arm of which is connected with the small chain (*D*). The chain lifts a small lever (*H*), which works by means of a catch (*I*) on the teeth of the screw-head, causing the screw to revolve. The small lever is steadied and pulled back to its place by a spiral spring (*P*), while another spring-catch underneath the frame prevents the ratchet-wheel from turning back. By properly adjusting the eccentric wheel

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[1] Edited by Dr. C. O. WHITMAN, Mus. Comparative Zoölogy, Cambridge, Mass.